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L6: Entry 14 of 72

File: USPT

Sep 24, 2002

DOCUMENT-IDENTIFIER: US 6453913 B2

TITLE: Method of cleaning a film deposition apparatus, method of dry etching a film deposition apparatus, and an article production method including a process based on the cleaning or dry etching method

Brief Summary Text (7):

One known technique to avoid the above problem is to clean the inside of the reactor chamber every one or more film deposition cycles to remove the film or polysilane deposited on parts other than where the film should be deposited. One known cleaning method is to use a chemical vapor reaction to reduce the deposited film or elements forming polysilane by means of vapor molecules. In this cleaning method, a gas such as CF₄, NF₃, or SF₆ is used as a cleaning gas and is supplied into the reactor chamber. The cleaning gas supplied into the reactor chamber is excited by energy of plasma, heat, or light so that the gas in the excited state reacts with elements forming the deposited film or particles, thereby converting them into vapor molecules, which are then removed by vacuum pumping means.

Detailed Description Text (90):

Copies of a test chart (product number FY9-9058, available from Canon Inc.) including characters over the entire area were made by exposing the test chart to an amount of light twice a normal amount of exposure light. The obtained images were observed to evaluate whether the images includes a line defect which separates a line image into two parts, and the images were classified into the following four grades. When an image included nonuniformity, the evaluation was performed for the worst portion in the entire image area.

Current US Cross Reference Classification (10):438/905

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Current US Cross Reference Classification (10):438/905

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L6: Entry 45 of 72

File: USPT

Dec 15, 1998

DOCUMENT-IDENTIFIER: US 5849092 A

TITLE: Process for chlorine trifluoride chamber cleaning

Brief Summary Text (10):

Because deposition typically occurs faster in the hotter areas of the chamber, and because the chamber temperature is not uniform, the build-up of deposits is not uniform throughout the chamber. Merely admitting a highly corrosive gas into the chamber for a period long enough to remove the heaviest deposits might overetch the areas with light deposits. While it is undesirable to overetch any chamber component, some chamber components, such as windows or fine nozzles, are especially vulnerable to attack by the etchant gases. The present cleaning processes utilizing F.sub.2 or ClF.sub.3 do not protect against overetching chamber components with light deposits. Overetching may result in compromised chamber performance and increased maintenance, which would decrease yields and throughput of the deposition system.

Brief Summary Text (13):

In one preferred embodiment of the method of the present invention, lamp heaters outside of the chamber heat a wafer susceptor to a temperature of 550.degree. C. by shining light, including both visible and invisible light, through a quartz (silica) window while the chamber is purged with nonreactive gas. Purging is accomplished by flowing a nonreactive gas, such as argon, into the chamber while a throttle valve on a vacuum system attached to the chamber is open. The purge gas displaces and dilutes other species in the chamber, and both are carried away in the exhaust stream. The susceptor is then heated to a temperature of 475.degree. C. and the chamber is pumped down for about 15 seconds, after which time the power to the heating lamps is set to low enough so that the lamps do not appreciably heat the substrate, but so that the lamp filament remains hot, thereby prolonging lamp lifetime. This condition is known as "idling" the lamps. A pump-down is accomplished by turning off the gas flow while leaving the throttle valve to the vacuum system open, which evacuates the system. After the pump-down, diluted ClF.sub.3 is introduced into the chamber, which is held at a pressure of about 3 torr for a total of about 200 seconds, and then the chamber is pumped down for another 15 seconds. The ClF.sub.3 reacts with the unwanted deposits to form volatile compounds that are carried away through the chamber exhaust. Because the susceptor was heated to the highest temperature, it is at a higher temperature than other parts of the chamber and deposited material in this region is etched away at a higher rate than in the cooler areas.

Detailed Description Text (10):

Heat is distributed by an external lamp module 29 and reflector 45. External lamp heater module 29 provides a collimated annular pattern of visible and infrared light 27 from lamps 58 through a silica window 28 onto an annular outer peripheral portion of susceptor 12. Reflector 45 reflects heat back to the susceptor and improves the heating efficiency and distribution. Such heat distribution compensates for the natural heat loss pattern of the susceptor and provides rapid and uniform susceptor heating for deposition or cleaning. Alternatively, an electrical resistance heating system may be used instead of a lamp heating system. An electrical resistance heating system may include a heater assembly (not shown) containing an electrical heating element (not shown). The heating element may be configured to provide a heat output pattern that compensates for the natural heat loss pattern of the heater assembly, resulting in uniform substrate heating.

Detailed Description Text (16):

FIG. 3 shows a simplified diagram of the system monitor for CVD system 10, which may include one or more monitors 50a. The interface between a user and controller 34 is via a CRT monitor 50a and light pen 50b. In the preferred embodiment two monitors 50a are used, one mounted in the clean room wall for the operators and the other behind the wall for the service technicians. Both monitors 50a simultaneously display the same information, but only one light pen 50b is enabled. The light pen 50b detects light emitted by a CRT display with a light sensor in the tip of the pen. To select a particular screen or function, the operator touches a designated area of the display screen and pushes the button on the pen 50b. The highlighted color of the touched area changes, or a new menu or screen is displayed, confirming communication between the light pen and the display screen. Of course, other devices, such as a keyboard, mouse, or other pointing or communication device, may be used instead of or in addition to light pen 50b to allow the user to communicate with controller 34.

Detailed Description Text (18):

FIG. 4 is an illustrative block diagram of the hierarchical control structure of the system control software, computer program 70, according to a specific embodiment. A user enters a process set number and process chamber number into a process selector subroutine 73 in response to menus or screens displayed on the CRT monitor by using the light pen interface. The process sets are predetermined sets of process parameters necessary to carry out specified processes, and are identified by predefined set numbers. Each process set configures the general CVD system to perform a particular operation. The process selector subroutine 73 identifies (i) the desired process chamber, and (ii) the desired set of process parameters needed to operate the process chamber for performing a specific process. The process parameters for performing a specific process relate to process conditions such as, for example, process gas composition and flow rates, temperature, pressure, cooling gas pressure, and chamber wall temperature and are provided to the user in the form of a recipe. The parameters specified by the process recipe are entered utilizing the light pen/CRT monitor interface.

Current US Cross Reference Classification (5):

438/905